

Governance Framework and Overall Readiness for AI Enabling in Supply Chain Management in Bangladesh

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Abstract

Digital transformation in Supply Chain Management in Bangladesh's RMG and SME sectors has become very popular because of the need for transparency and digital compliance by foreign customers as well as demand forecasting, inventory control, logistics, traceability and operational decision-making. But most organizations could not implement Artificial Intelligence and digital technology yet. The research reviews several academic papers, industry surveys, institutional reports, government sources and other secondary sources to investigate how prepared Bangladesh is to enable, use and maintain digital technologies like Artificial Intelligence in its supply chain management and what the challenges are there. Studies suggest that high cost of implementation, insufficient number of experts, weak digital infrastructure and the unreadiness of employees and supply chain partners to adapt to a new system are the very obstacles in implementing AI not just in Supply Chain Management but also in various other departments of an organization. Other than that, big firms like export-oriented firms tend to be more prepared than SMEs in accepting advanced digital systems due to a financial and technological edge. To understand this unevenness, this research proposes a 'Two-axis Digital Readiness Matrix' which is based on an organization's internal capability and digital connectivity with external supply-chain partners. This study recommends higher opportunities for financing, advancement of workforce skills, increase in management capability and digital integration among supply chain participants

Keywords

Artificial Intelligence (AI), Supply Chain Management (SCM), SME (Small and Medium-Sized Enterprise), Digital Transformation, Digital Infrastructure, Digital Readiness Matrix, Supply Chain Visibility, Buyer-Driven Compliance.

1. Introduction

Artificial intelligence has become an increasingly important force in supply chain management. It helps in improving demand forecasting, inventory control, logistics planning, procurement and operational decision-making. AI can comprehend big data and figure out patterns that would take humans loads of time and analysis. As a result, organizations can respond to demand changes quickly, reduce operational inefficiencies and improve supply chain performance. Therefore, supply chain management is not merely an administrative function today, it is deeply connected with an organization's competitiveness and resilience.

Bangladesh is a suitable and important sample to analyze this change upon. There is a vast export-oriented RMG sector, an increasingly growing e-commerce industry and many SMEs deeply involved in manufacturing, retail, logistics and supply chain activities. Pressure on these sectors is rising day by day to increase efficiency, traceability, compliance and supply chain visibility. Therefore, AI-based analytics, IoT-enabled tracking and digital technologies are needed to make significant advancements in demand planning, inventory visibility, logistics coordination, export compliance and customer service.

However, real-life usage of AI and advanced digital technologies is limited and uneven across all organizations in Bangladesh. Several studies illustrate that most organizations still rely on the manual processes or basic digital systems whereas, large and resource-heavy organizations are comparatively ahead in adopting advanced technologies (Hai et al., 2024; Sharif et al., 2024).

This unevenness is specifically important from the SMEs' perspective. Small firms usually have fewer financial resources, less advanced technology and fewer skilled employees. Hence, implementing new advanced technologies is much harder for them as compared to large firms. If this gap remains or even increases, small firms may lag behind in competing with the larger firms and may gradually move away from the digitally integrated supply chain.

Various obstacles in AI enabling in SCM in Bangladesh like high implementation and maintenance cost, poor digital infrastructure, resistance towards organizational changes etc. have been reported already in the previous studies. However, a major limitation of the current research is that many studies are sector-specific such as RMG, e-commerce, agriculture or SMEs. Furthermore, many studies have examined financial, technological, organizational and policy-related problems across organizations.

This creates an important research gap. AI adoption in supply chain management does not depend on a single factor. Rather, several factors work together to influence its success. For instance, financial capability of a firm affects the technology investment; technological readiness ensures

quality outcome; new systems cannot operate without skilled workforce and if supply chain partners are not ready to be a part of this digital chain, a firm can never achieve the best out of this system. For this reason, these factors need to be examined together rather than separately.

This study attempts to address this research gap by focusing on financial constraints, technological readiness, organizational and workforce capability and readiness, supply chain connectivity, government policy and regulatory support. It also considers how the effects of these factors may differ across firms with different levels of resources and digital capability.

2. Literature Review

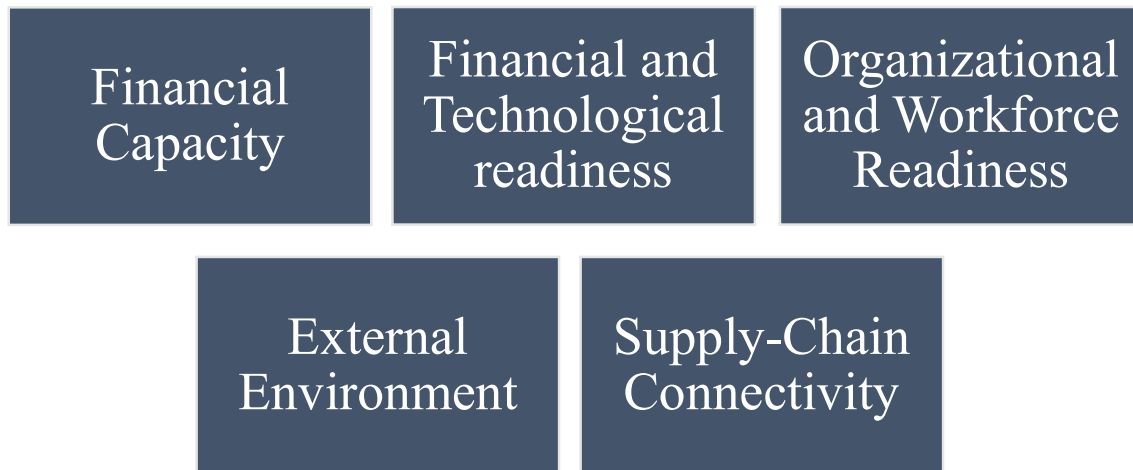
Interest in AI within supply chain management has grown a lot, mostly because it can possibly improve demand forecasting, inventory planning, logistics, operational efficiency and supply chain visibility. According to Sharif et al. (2024) AI can help firms process big data more efficiently, increase forecasting accuracy and respond to any changes in supply chain as quickly as possible. In the context of Bangladesh, a huge portion of research on AI implementation in SCM is done focusing on RMG and E-commerce sectors. In these sectors, using AI-based analytics, tracking system and automation, improvements can be seen across inventory visibility, demand planning, export compliance, fraud detection and customer experience (Avi et al., 2024; Abdur et al., 2023).

However, there is a meaningful gap between understanding the potential benefits of AI enabling and the real-life usage of it. Several studies point out that most organizations are still stuck with manual or, at best, basic digital systems, while larger organizations with more resources have moved further ahead in adopting advanced technologies (Hai et al., 2024; Sharif et al., 2024).

Thus, it can be inferred that being only aware of AI's usefulness doesn't necessarily mean that it's being adopted. A firm needs to have financial resources, technological capabilities, skilled employees, management support and suitable external environment.

Current literature's another limitation is that it often discusses AI adoption at an individual firm's level. But within a supply chain, different organizations' digital readiness is not the same. Specially, in RMG sector - large exporter, subcontractor, raw-material supplier, logistics provider and small supporting firm have different financial and technological condition. Therefore, to understand the AI adoption in SCM, we have to look at the relationship and digital connection among various supply chain participants rather than only looking at individual firms.

Barriers in Enabling AI Supply Chain Management



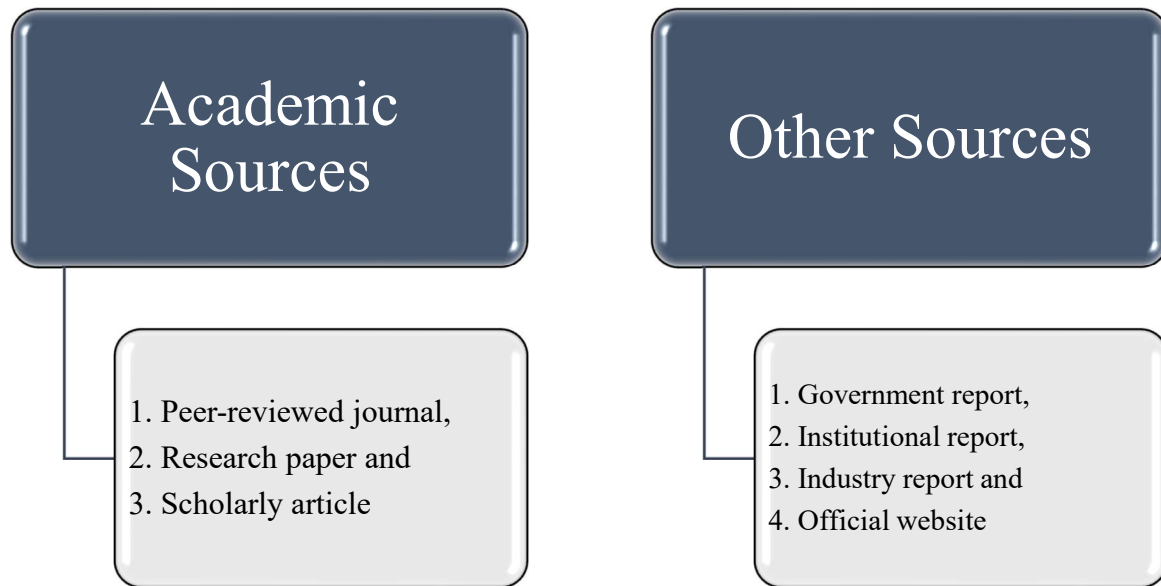
3. Data & Methods

Research Design

This study is qualitative and built entirely on secondary research. It looks at what role AI plays in supply-chain decision-making, and what opportunities and challenges come with it. There were no surveys, no interviews, none of that. What the research does instead is pull together academic work already out there, along with government publications, institutional reports, industry material, and official websites. That mix is what lets the study tie established academic knowledge to what is actually happening right now on the technology, regulation, and industry side of things.

Data Sources

Most of the data was collected from secondary sources.



Data Collection and Selection

Sources used were selected based on relevance, credibility and how much they actually contributed to what this research is trying to do. We went through academic databases, scholarly searched platforms and official websites to find the most meaningful resources. While searching, keywords like AI, supply-chain management, decision-making, digital transformation, cybersecurity, financial constraints, government support, data sovereignty and vendor dependence were used. More focus and volume of selection was given to peer-reviewed academic work and other authoritative sources. Websites and institutional reports mostly filled in wherever policy, regulation, or industry trends needed something more current. If a source did not connect to what the study was after, or just was not credible enough, it got dropped.

Data Analysis

Everything collected went through thematic synthesis. Findings from different sources were lined up against each other and sorted into the main themes that kept coming up around AI adoption in supplychain decision-making. Instead of treating each source as its own island, the study brings

the findings together to look for patterns that repeat, places where sources disagree, opportunities, challenges, and gaps that are still open in the research. A fair amount of attention went to how the upsides of the technology run into the barriers standing in front of it, and what that push and pull actually means for how well AI ends up getting adopted and used in decisions.

Research Trustworthiness

To keep the findings solid, the study leans on a range of independent, credible sources instead of resting on one publication or provider. Where it made sense, academic findings got checked against official reports and other institutional material. Peer-reviewed literature and other authoritative sources carried more weight than the rest, which cut down the risk of leaning on unsupported claims and gave the interpretation of results something firmer to stand on. Comparing sources against each other also made it easier to see where things lined up, and where they did not.

Scope and Limitations of the Methodology

Since this study is built only on secondary sources, it does not produce primary evidence straight from supply-chain professionals, firms, or other stakeholders. What comes out of it instead is a synthesis and interpretation of what is already out there, not a direct read on what firms are experiencing on the ground. The quality and availability of secondary sources also differs quite a bit depending on the source and the topic, and that is a limitation worth flagging. That said, a secondary research approach still fits what this study is trying to do. It allows existing knowledge to be pulled together, lets emerging challenges and opportunities surface, and makes room to look at what AI adoption actually means for supply-chain decision-making in a broader sense.

4. Result and Analysis

4.1 Current picture of AI usage in Supply Chain Management

AI keeps showing up more in supply chain management these days, mostly as a way to speed decisions along and get more accuracy and quality out of managerial choices. Demand forecasting, inventory optimization, procurement, supplier evaluation, predictive maintenance, logistics planning, quality inspection, risk management, AI-enabled systems now touch all of it in one way or another. Shahzadi et al. (2024) did a systematic review which states that technological capabilities, organizational readiness, environmental condition and skills of the workforce have the most impact in enabling AI in supply chain.

Bangladesh is a useful case to look at here. Its supply chains face more global competition than before, tougher buyer demands, logistical bottlenecks, and pressure to be traceable and efficient at the same time. AI could help with a lot of that, cutting waste, forecasting better, less downtime, smoother transportation, more visibility across the chain. There is research backing this up, at least in terms of what people believe. Islam et al. (2024) did a survey in 120 organizations where more than 96% of the participants think that using AI can boost capability, production, cost control and supply chain optimization.

Believing AI is useful and actually using it, though, turn out to be pretty different things. Sharif et al. (2024) did research on supply chain professionals in Bangladesh and found out that even though most of them admit the potential ability of AI in their workplace, a significant portion of them do not use it in their daily life and professional life due to cost barrier, lack of skills, a general struggle to adapt etc. Similar results were found in Tamim et al. (2024)'s survey in agriculture-based supply chain where the main barrier was poor digital infrastructure and lack of skills. It is not just one industry dealing with this. The pattern seems to run across several parts of the country's supply-chain ecosystem.

Which raises the real question. It is probably not whether AI is useful, most people already seem to agree it is, but whether firms can afford to adopt it and whether they can keep enough control over the data, infrastructure, and vendors that AI-driven decisions end up relying on. This section takes on two things that tie into that: financial constraints and government incentives, and then data sovereignty, cybersecurity, and vendor dependence.

Start with technological readiness and data infrastructure. Bangladeshi manufacturing firms are behind here, and not by a small margin. Till 2024, only 38% of the manufacturing firms used digital tools like ERP or IoT. Moreover, Bangladesh spends around 0.2% of GDP on research and development; whereas, China spends 2.4% and Germany spends 3.1% on research and development. Habib et al. (2025) surveyed RMG sector professionals where 61.7% respondents said that inadequate infrastructure like power and internet supply was a major barrier. In the same survey, 58.1% of respondents pointed towards digital skills shortage.

ERP adoption itself is uneven, and SMEs seem to bear the brunt of it. Reviews say ERP's role in the RMG sector and found that where it has been adopted, it does help with compliance, workflow coordination, and real-time inventory monitoring. But SMEs face high costs to implement it, a lack of digital skills internally, reluctance from within the organization, and the need to customize the system factory by factory. All of that keeps adoption fairly limited. Experts used the Technology-Organization-Environment framework on Bangladeshi SMEs and found technological readiness, compatibility with legacy systems, and vendor support all mattered a lot for whether a firm adopted cloud-based ERP. Security threats and government support, interestingly, did not seem to matter much at all.

There is also something worth flagging here: digital readiness mostly shows up when buyers push for it, not on its own. Garment factories in Bangladesh are going digital right now largely because big foreign buyers and new rules are forcing the issue, the EU's requirement to digitally track every garment by 2027 being one clear example. BGMEA teaming up with the Dutch tech company AWARE in 2026 to build blockchain-based traceability specifically for that EU requirement fits the pattern.

Digital readiness is not spread evenly across the supply chain either. Breaking it down by tier makes this clearer.

At the top, Tier 1, is where nearly all the visible progress sits. Large export-oriented factories with direct ties to international buyers are the ones running ERP systems, IoT tracking, and blockchain pilots.

Backward-linkage suppliers sit in a weaker spot, even though there is real opportunity for integration. Fabric suppliers, accessories suppliers, customs-related businesses, none of them are really plugged into manufacturers' planning systems. Bangladesh imports over 80% of its fabric, and that dependency alone adds 55 to 75 days onto lead time.

Then there is Tier 2/3, subcontractors and home-based workshops. They barely show up in the data that exists. These are the actors who consistently get skipped when digital investment happens, and they are the ones most at risk of losing buyer relationships altogether.

Put it all together and the supply chain is still a long way from being digital end to end:

Factory → ERP → International Buyer

Fabric Supplier → Manual system

Freight Forwarder → Separate system

Customs → Another system

4.2 Challenges and Barriers in Case of Implementation

AI can genuinely help supply-chain management, no doubt about that, but getting it actually working in Bangladesh is a whole different story. The obstacles touch finance, infrastructure, data, skilled labour, organizational readiness, supply-chain partners, regulation, basically everything, and honestly these problems feed into each other way more than most people admit. Bad data quality limits what AI can even do, and high costs push firms toward leaning on outside cloud and AI vendors instead of building their own thing (Shahzadi et al., 2024).

4.2.1 Financial Constraints

Cost is one of the biggest hurdles here and it is not just the software price tag either. Firms also need computing infrastructure, sensors, system integration, data prep, staff training, cybersecurity, plus ongoing maintenance and upgrades on top of all that. For SMEs and smaller supply-chain partners, this piles up fast into a real burden (Islam et al., 2024; Heimberger et al., 2026; Sharif et al., 2024).

There is also just plain uncertainty about what a firm actually gets back for its money. Sure, AI can cut excess inventory, sharpen forecasting, reduce downtime, but the real payoff depends on data quality, demand conditions, supplier reliability, how well the tech fits what a firm is already doing. So, firms end up stuck asking two different questions, can we even afford this and will it actually pay off. Our review found that Bangladesh still has pretty thin evidence on real implementation costs, payback periods, and measurable ROI (Islam et al., 2024; Heimberger et al., 2026; Sharif et al., 2024).

4.2.2 Data Quality and Digital Infrastructure

AI-driven supply-chain decisions depends on reliable, timely and correct data. Firms need info on suppliers, inventory, purchasing, production, transport, customers, demand. However, a lot of this information stays scattered in disconnected systems or was never properly digitized to begin with (Sharif et al., 2024; Government of Bangladesh, Information and Communication Technology Division, 2024; Opara-Martins et al., 2014; National Cyber Security Agency, n.d.). In the Bangladesh survey reviewed here, 86.7% of respondents said data access or data quality was a problem for them (Islam et al., 2024).

These data related problems are creating negative impact in case of supply-chain performance which can lead to incorrect predictions and less effective decisions (Sharif et al., 2024; Government of Bangladesh, Information and Communication Technology Division, 2024; Opara-Martins et al., 2014; National Cyber Security Agency, n.d.). Infrastructure's another layer on top of that, firms need dependable internet, cloud services, computing capacity, sensors, other digital systems before advanced AI can even work properly. The World Bank frames this around four foundations, connectivity, compute, context, competency, which really just means infrastructure and skills need to grow alongside AI adoption, not after the fact (World Bank, 2025; Heimberger et al., 2026; Shahzadi et al., 2024).

4.2.3 Shortage of Skilled Employees

Then there's a shortage of people with the right AI and data skills. Implementing AI takes staff who can manage the data, understand how these systems actually work, keep an eye on

performance, turn outputs into real decisions (Shahzadi et al., 2024). According to a Bangladesh survey, 96.7% said finding AI-skilled people was just hard. Meanwhile staff already in supply-chain roles often barely know AI, and some worry it'll replace them. As a result, there's a strong resistance, resistance slows everything down (Islam et al., 2024). Hiring specialists alone doesn't cut it, existing staff need training too so they actually get how AI works and how to use what it spits out day to day (Islam et al., 2024; Sharif et al., 2024).

4.2.4 Readiness of Supply-Chain Partners

AI adoption doesn't really help much if only one company in the chain is advanced. A big manufacturer could roll out AI forecasting or inventory management fine on its end, but if suppliers and logistics partners are still stuck on manual systems, info just doesn't flow right across the chain. Kind of a digital weakest-link thing, smaller suppliers or logistics providers cap whatever benefit the more advanced company actually sees from its own investment (Sharif et al., 2024). Matters a lot in Bangladesh specifically, since a lot of big export firms sit on top of networks built from smaller suppliers. Our review also flags fragmentation between leading firms and upstream suppliers as a real barrier to full integration (Sharif et al., 2024). Import dependency plays into this too. Over 80% of fabric gets imported, and that alone stretches lead times by 55 to 75 days. Port and customs infrastructure's another bottleneck. Chittagong Port runs with roughly a quarter of the gantry cranes and a third of the cargo-handling equipment it actually needs, so no amount of digital polish on the factory floor fixes a problem sitting at the port instead (Atik et al., 2020). Cost keeps popping up as a barrier too, again. Deploying IoT reportedly ran about \$150,000 for one mid-sized exporter, a number big exporters can eat but one that's way out of reach for smaller subcontractors further down the chain (Hosain, 2025; Hai et al., 2024). Talking to outside systems is patchy as well. Some factories run ERP fine, sure, but that doesn't mean it actually talks to buyer systems through EDI, APIs or shared dashboards. And regulation's outpacing what suppliers can actually handle. Bangladesh's rolling out stuff like e-invoicing and digital tax to keep up globally, but most companies just can't meet these requirements yet. There's a real risk of smaller suppliers getting squeezed out entirely too. As global buyers push harder for digital adoption, Tier-2 and Tier-3 suppliers, subcontractors, home-based workshops, they might struggle to keep up, and some could lose access to global supply chains altogether (Castañeda-Navarrete et al., 2021).

4.2.5 Cybersecurity and Data-Related Risks

The more firms depend on AI, the more they depend on the data feeding it. Supply-chain systems hold sensitive stuff, supplier details, purchasing records, production schedules, customer data, pricing, machine data, all of it. A cybersecurity breach here does way more than just leak information. Mess with the data an AI system relies on, and its recommendations go bad right along with it (Sharif et al., 2024). A few quick examples. Manipulated demand data skews forecasts. Manipulated supplier data messes up supplier selection. Bad machine data leads to bad maintenance calls. Manipulated logistics data causes inefficient routing or delivery disruptions (Sharif et al., 2024). So, cybersecurity here isn't just about protecting information, it's about protecting the accuracy of whatever decisions AI ends up making with it.

4.2.6 Data Sovereignty and Vendor Dependence

Data sovereignty becomes a real issue the second firms start using foreign cloud or AI providers. Data generated in Bangladesh might end up stored or processed somewhere else entirely, which raises real questions, where does it live, who can access it, whose laws apply. There's vendor lock-in to worry about too, firms can get tied to one provider's cloud, AI models, APIs, software, support, and switching later gets expensive and messy fast (Opara-Martins et al., 2014). Real trade-off here. External providers lower the upfront cost of getting started, but they deepen long-term dependence on whoever's providing it. Bangladesh's Draft National AI Policy 2026 to 2030 already gets this tension. It proposes safeguards for sensitive data, rules on cross-border transfers, open standards and interoperable systems to cut vendor lock-in down. Still just a draft though, so read it as an emerging framework, not an enforceable rule yet (Government of Bangladesh, Information and Communication Technology Division, 2024).

4.2.7 Regulatory and Governance Challenges

The AI policy environment of Bangladesh is still in development phase. The National Artificial Intelligence Policy 2026 to 2030 Draft V2.0 went out for public consultation back in February 2026, and that consultation has now been finalized. The policy committee is working through submitted recommendations now before finalizing anything. Matters because firms need clear rules on data protection, cross-border processing, cybersecurity, accountability, how AI gets used

in operations generally (Government of Bangladesh, Information and Communication Technology Division, 2024). The main challenge is not just introducing an AI policy, it's making sure that policy actually gives businesses enough clarity to make long-term investment decisions with confidence.

4.3 Initiatives That Are Currently Underway and Possible Implementation Measures

No singular criterion can solve all of this. What's needed is a mix, financial support, employee training, better framework, stronger data governance, phased rollout.

4.3.1 Financial Support and Government Incentives

Civil approval will help reduce both cost and risks in this case. Considerations should include:

- Tax incentives for eligible AI investments
- Reduced import tax for AI related equipment
- Low interest rate finance for digital shift
- Small-medium enterprises have access to guaranteed credit
- Matched funding for AI initiatives
- Capacity building grants
- Supply chain Ai pilot grants

The country of Bangladesh already has some subsidies for tech investments and its framework for investments includes AI-based system design and manufacturing depending on certain conditions. However, tech investment subsidies are not equal to the subsidies targeted at businesses using AI in supply chains. (Bangladesh Investment Development Authority, n.d.). Future schemes could aim more directly at firms using AI in manufacturing, logistics, logistics storage, vendor acquisition, supply-chain decisions.

4.3.2 Starting with Small AI Projects

Instead of rolling AI out across the whole chain at once, firms can start small, somewhere results are easier to actually measure. Decent starting points:

1. Demand forecasting

2. Inventory management
3. Predictive maintenance
4. Route optimization
5. Supplier-risk monitoring
6. Warehouse management (Shahzadi et al., 2024)

Firms can compare how these pilots do against their existing baseline, and if the numbers show real gains in cost, accuracy, efficiency, expand from there (Shahzadi et al., 2024; Sharif et al., 2024). Not unique to Bangladesh either honestly. Recent supply-chain research suggests plenty of organizations elsewhere are also going step by step instead of redesigning their whole model overnight (Shahzadi et al., 2024).

4.3.3 Training and Workforce Development

Training should be baked into AI implementation from day one, not tacked on after. Technical staff need training in data management, AI, cybersecurity, while supply-chain employees and managers need to know how to read and act on AI-generated recommendations.

The Bangladesh survey shows a real gap here. 96.7% said finding AI-skilled professionals was tough, but only a much smaller share of firms had actually done anything concrete about it (Islam et al., 2024). Training also helps with the anxiety around being replaced. Done right, AI supports employees making faster, better-informed calls, doesn't have to replace them.

4.3.4 Better Data Governance

Since data underpins everything AI does, firms need proper systems for collecting, storing, sharing, protecting it. That means:

- Shared data standards
- Explicit data rights
- Permission frameworks
- Network security benchmarks

- Routine inventory data validation
- Compliance monitoring systems
- Data sovereignty provisions
- Data portability rights (Government of Bangladesh, Information and Communication Technology Division, 2024)

Bangladesh's Draft AI Policy V2.0 already proposes high-risk logistics data to be stored and processed within Bangladesh or trusted jurisdictions, under proper data protection measures. Also pushes open standards, interoperable formats, standardized APIs to cut vendor lock-in (Government of Bangladesh, Information and Communication Technology Division, 2024).

4.3.5 Supporting SMEs and Smaller Supply-Chain Partners

The government and industries should also consider more carefully the technological readiness of small firms. Small firms working as the suppliers of the big firms are not being helped in any way although the big firms are assisted, then the digital divide between different levels within the supply chain would just keep on expanding. This would secure that the gains of AI would be realized throughout the entire chain.

4.3.6 Port and Customs Digitalization

CPA SKY system introduced in February 2026 introduced paperless processing, live tracking of vessels and radar monitoring. Chattogram Port Authority maintains that it has helped minimize ship waiting time at outer anchorage. Now CPA SKY has been interconnected with the National Single Window facility which facilitates customs clearance to be pioneered even before the arrival of ships at the port. Another separate project Bangladesh Single Window (BSW) synchronizes over 20 government departments and requires mandatory digital submission for some certificates, licenses and permits. The World Bank approved US \$300 million for full deployment of the National Single Window and automation of customs processes at major ports including Chattogram.

4.3.7 Traceability of Buyers and Digital Product Passport

The biggest export sector in Bangladesh, Ready-made Garments (RMG), is making progress in fulfilling the digital traceability related demands of international buyers and the European Union.

- With the involvement of BGMEA and tech institutions, companies are testing ways of tracking the full process from raw materials to the final product through Digital Product Passport (DPP) pilot projects.
- Coats Digital's FastReactPlan (a digital planning platform) has increased Azim Group's efficiency of planning by 15%. Similarly, it is helping to improve digital efficiency and delivery time at FCI (BD) Ltd. and Tusuka.

Another possible initiative, which is in the stage of recommendation, is that industry recommendations have called on the government and BGMEA to create funds to help SMEs digitalize and to reduce import dependency by increasing local production of man-made fibre. (SANEM, March 2026)

4.3.8 BGMEA asset enterprise based training program

World Bank funded, this program has 193 batches and about 4,632 trainees registered, of whom 2,328 have already received certificates. The program is scheduled to end in December 2026, but the government has informed that similar initiatives will be continued with new programs.

4.3.9 Skill contract of EPB–BGMEA–BKMEA–BUFT

The programme, signed in June 2026, aims to provide training to 22,815 workers and mid-level officers in fiscal years 2026-27 to 2028-29. It includes short-term training for workers and a six-month master's diploma for officers. Importantly, the syllabus has been updated to include circular machinery operations to meet the growing need for automation.

4.3.10 SICIP–BGMEA HR workshop

The HR leaders of 20 big RMG and textile groups met to discuss future workforce development in July 2026. This is very important because it shows that institutional readiness and workforce planning are continuously considered different from basic technical training.

4.3.11 Recognition of Prior Learning (RPL):

BGMEA has made RPL easier through its training centre, but industry stakeholders are calling for more help between the National Skills Development Authority and BGMEA. The purpose of it is to make the fragmented training process more organized.

4.3.12 BGMEA-GIZ collaboration:

Lasting from May 2026 to February 2028, this initiative focuses on green transformation, energy efficiency, the circular economy, renewable energy training, and other areas of technical training. Although it is not fully digitalized, it plays a vital role in overall workforce development.

4.3.13 BGMEA-ActionAid Bangladesh collaboration:

This collaboration, which is ongoing from January 2026 to December 2030, focuses on human rights, environmental due diligence, and compliance. From a governance perspective, it contributes to institutional preparedness in these areas.

4.3.14 H&M Foundation initiative for the RMG workforce:

It works on women workers' employability on the basis of increasing automation.

4.3.15 Sarathi/Sarathi II:

This program, operated by Swisscontact, has benefited seven hundred thousand RMG workers through mobile banking services, exceeding its target of reaching 500,000 workers. It solves another problem related to the workers' preparation that is often overlooked.

4.3.16 National digital infrastructure

These sector-specific programs are also supported by broader national digital policies.

- Bangladesh's National Digital Transformation Strategy (2025–2030) provides a huge infrastructure of digitalization, including a National Digital Architecture, a National Data Exchange, and plans to digitize more than 800 government services.
- A Five-Year Strategic Framework for Reform and Development (July 2026–June 2031) is currently being formulated to provide comprehensive policy guidance.

On the other hand, BGMEA is working with Digital Bridge Partners to make an AI-driven Digital Factory Passport. Hopefully, it will simplify ESG compliance reporting and reduce the audit fatigue of the factories which work with international buyers. In addition, BGMEA reported that major Bangladeshi suppliers are already investing in advanced machinery, ERP systems, and AI tools for production planning and quality control. It further reports that some factories are using AI to optimize fabric cutting and forecasting (Star Business Report, 2025).

4.4 Future Picture

If we can successfully implement the suggested actions, Bangladesh's supply chains will slowly evolve from using the conventional approach to decision-making towards using more integrated and advanced supply chain processes. Looking to the immediate future, AI will most likely be used by firms as a tool to aid in decision-making by means of forecasting, planning, maintenance and logistics (Shahzadi et al., 2024). Eventually, improved integration of ERP, IoT, cloud computing and AI will enable firms to achieve more visibility within their supply chains (Abdur et al., 2025). Looking into the distant future, AI could assist in identifying risks, disruption forecasting, scenario comparison and coordination of decisions at the supply chain levels (STAMFORD, 2026; World Bank, 2025). Therefore, the potential process could be illustrated as follows:

Digitalization → Data Integration → AI-Assisted Decisions → Predictive Supply Chains → More Resilient and Integrated Supply Chains

Nonetheless, the future of supply chains does not have to be fully automated. Humans will continue to play the role in strategic decision making and in handling special situations when responsibility is needed (UNESCO, 2026). Hence, a more realistic future of Bangladesh will be an improved supply chain powered by AI where AI will give its predictions and recommendations while humans will be taking part in decision making (STAMFORD, 2026; World Bank, 2025; UNESCO, 2026).

The country's government budget for FY2026-27 allocated Tk 2,049 crore for the ICT Division, Tk 2,141 crore for the Posts and Telecommunication Division, and Tk 18,115 crore for the Ministry of Science and Technology with an evident intention to boost the share of ICT contribution to GDP from 1 to 2% currently to 10% within five years' time. No allocation is devoted specifically to

manufacturing or RMG hence it is unclear whether this money makes it to factory-level ERP and data collection systems.

Notably, according to the industry perspective on the RMG sector small factories will not be able to adapt to new technologies without any intervention and calls for the creation of the RMG AI program which will fund the experimentation in factories, finance sensors and inspection devices at concessional rates, and also provide accelerated depreciation of investments (The Daily Star, 2026). This fits the TOE framework well since according to it, vendor support and compatibility of the systems, and not governmental support in general, predict the adoption of technology. In the readiness side three major changes are coming together in 2026–2027, and they are likely to shape Bangladesh’s apparel sector more than any single programme:

- ❖ LDC graduation (November 2026): Bangladesh will lose some of the trade advantages it currently enjoys as an LDC. This puts pressure on the industry to become more competitive.
- ❖ EU Digital Product Passport or Ecodesign requirements (2027): This is likely to be the strongest driver of digital traceability. Current DPP pilots, the AWARE blockchain initiative, and port single-window integration can be seen as preparations for this requirement.
- ❖ ASSET training project (December 2026): One of the largest ongoing skills programmes is scheduled to end in December 2026. Although the government has indicated that training support will continue, no clear replacement programme has been identified yet.

This is important since the year 2026-2027 will be a very important time in terms of assessing the readiness of the Bangladesh supply chain.

At the same time as increased pressure from trade practices, international purchasers will also require greater levels of digital compliance and traceability. Bangladesh is already advancing in term of digitalization of ports and customs through CPA SKY, NSW and \$300 million funding from World Bank. These investments are expected to lead to digitalization of the supply chain itself by 2028-2030.

Although improved technological solutions don’t always mean improved process efficiency. Increased container dwelling times despite digitalization point out to some processes that still are manual. In other words, Bangladesh may end up with digital systems tracking and submitting data, while the process itself will remain inefficient.

The situation is more serious for small suppliers since most of the existing digital efforts, such as DPP pilots, FastReactPlan and blockchain traceability, target large exporter companies. The funding proposed for digital solutions for SMEs has not been turned into actual programmes yet.

In short, Tier-1 exporters may become EU-ready faster, but fabric, accessories, and other backward-linkage industries may struggle to adopt in the same manner.

5. Discussion

5.1 Data and Surveys

This study is based on secondary research rather than a new primary survey. Therefore, the findings are developed by reviewing existing surveys, academic studies, government documents, institutional reports and industry evidence. One of the most relevant Bangladesh-specific studies reviewed is Practices of Artificial Intelligence to Improve the Business in Bangladesh. The data is collected from 120 respondents from 10 different types of businesses in Bangladesh. It is analyzed by using MS Excel and SPSS. The study examined AI usage, perceived benefits, implementation challenges and possible solutions (Islam et al., 2024).

The survey covered areas such as: Current use of AI, perceived benefits of AI, availability of skilled professionals, data access and quality, funding problems, Infrastructure and regulatory barriers, Employee resistance, fear of job displacement, actions already taken by firms and possible solutions for improving AI adoption (Islam et al., 2024).

Our review of this study found several important figures. Around 96.7% of respondents reported difficulty finding AI-skilled professionals, 86.7% reported data access or data-quality problems, 66.7% reported funding challenges and 93.3% identified inadequate infrastructure or regulatory support as challenges (Islam et al., 2024).

Review of International Evidence

The international evidence has also been reviewed to determine whether the issues found in Bangladesh are unique or they are part of a wider phenomenon related to AI adoption. The World Bank's report on Digital Progress and Trends Report 2025 has categorized the four key basics required for the readiness for AI as connectivity, compute, context, and competency. These have proven useful to understand how infrastructure, data, and skills play an important role prior to large-scale adoption of advanced AI (World Bank, 2025). The international evidence provided by the state of Singapore claims that in 2026, 28.5% of firms had adopted AI while only 3.8% of firms

have used AI in core processes. This clearly demonstrates the difficulty to move towards deep integration of AI when the economy is highly digitally developed (Ministry of Manpower, Singapore, 2026). The international evidence proves to be useful for Bangladesh as it has helped to realize that AI adoption is not about access to the technology. Instead, the firms need

National picture

According to the 2023 Digital Progress and Trends Report of World Bank, only 46% of companies in Bangladesh used computers from 2019 to 2022, whereas 50% of the companies had internet connection. It is much less than other countries like India, Vietnam, Korea, and Brazil where around 100% of the companies used computers and internet.

According to the 2024 report of the World Bank, 80% of the RMG companies use semi-automatic sewing technology, while only 9% are using automatic technology. More importantly, 32% of the firms have no KPI measurement at all, indicating the lack of management capabilities to effectively utilize digital technologies.

SME and RMG surveys show:

Hai et al. (2024) surveyed 367 SMEs and found out that 41.1% of them use manual systems, while 34.1% use simple technologies and 21% use advanced digital technologies. In this study, the major obstacles included high cost (49%), lack of skills (43.1%), reluctance of employees (28.9%), and poor infrastructure (23.7%). In addition, another study indicated that cost, skills, and infrastructure continued to be the major barriers even in 2025 with the survey of 400 SMEs. However, it can be seen widely that the support of the government, competitive pressure, and training of the employees are playing roles in adopting digital technology. All of these results are supported by Nipa (2020) as she also identified the poor infrastructure, shortage of skilled laborers, and reluctance to change as major barriers in RMG industry, suggesting that these problems have remained largely unresolved over time. Furthermore, it can be seen from a 2025 survey of 249 RMG professionals that technologies like ERP, AI, IoT, and Blockchain have become very familiar and

have improved lead times, defect detection, traceability, and compliance. However, another survey of 75 employees from 4 RMG firms in 2025 showed that employers face trouble in assessing their readiness for advanced technologies. Another reason could be that employees may be reluctant to adopt them due to job security issues. Thus, the above evidence suggests that for successful digital transformation, it is not sufficient just to invest in technologies: finance, skilled workers, infrastructure, readiness, training, and change management are also required.

Digitization of wages

There is a good illustration from digital wage payments. Digital payment of wages in the RMG industry rose up to 90% during the period of COVID-19 due to the encouragement of digital payment by the government. Once the pressure of government ceased, the ratio fell to 54%. It means that technology adoption based on external pressure is likely not sustainable after that pressure disappears.

Readiness of organization

It was found out that the organizational readiness in terms of knowledge and leadership is at the moderate level, while people, finance, and employee readiness is low according to Hossain et al. (2024). Hence, it means that even the existence of technology is not enough but also there should be proper people, leadership and finance.

Impact of automation on employment of people

Automation already influences the employment in the RMG industry. According to the joint research of Solidaridad Bangladesh, BRAC University and Bangladesh Labour Foundation, the sewing occupation experienced the reduction by 26.6%, particularly among helper positions. The impact of automation is especially significant for women and unskilled employees.

Evidence for Technological Readiness and Data Infrastructure consists of four kinds of primary data obtained by other researchers. There is one large-scale survey conducted among 249 RMG professionals who have no less than five years of industry experience and provided valuable information to calculate the percentage of the barriers (Habib et al., 2025). There is one more small-scale research, namely, the interview of ten stakeholders with secondary sector data in order to get the sector-by-sector AI and ERP adoption figures. A qualitative case study involved conducting of the face-to-face semi-structured interviews and focus group discussions among 51 managers in 10 omnichannel SMEs using the Technology-Organization-Environment framework. Finally, secondary-data analysis included analysis of BGMEA publications and previously done structured studies rather than primary data collection. None of the four kinds of data mentioned above was collected specifically among RMG backward-linkage firms and subcontractors, which is one of the gaps this project's own primary research could address.

5.2 Detailed Findings

A number of key findings can be derived based on the analysis of the available evidence.

Finding 1: While there is some awareness about AI, there is limited ability to implement it

According to the survey, firms normally understand the advantages of implementing AI. Respondents associate it with higher efficiency, better decision making, increased productivity, lower costs, and better supply chain management. Still, there are also issues related to financing, lack of data, infrastructural constraints, and unavailability of skilled employees. This suggests that the main issue is not disinterest in AI. The main challenge is the inability to have the required resources to implement it.

Finding 2: Human resources remain one of the biggest barriers

The finding that 96.7% of respondents have difficulties in recruiting AI experts indicates that human resources is a major constraint for Bangladesh (Islam et al., 2024). This suggests that growing investments in AI without growing investments in human capital might yield no results.

Finding 3: Data is both an asset and a risk

While the 86.7% figure related to data availability and quality shows that Bangladesh suffers from fundamental data readiness challenges (Islam et al., 2024), the accumulation and sharing of data also raises concerns about cybersecurity, privacy, and data sovereignty. This suggests that the goal of collecting data needs to be supplemented by goals of using appropriate data and ensuring its proper management.

Finding 4: Financial constraints might increase vendor dependency

As a result of high cost of AI implementation, firms might consider outsourcing it and use cloud solutions, which requires fewer resources at the start of implementation. This generates the following causation chain:

High cost of AI implementation ↓ Cloud/external solution ↓ Lower initial investments ↓ Greater dependency on the vendor ↓ Risks of switching, cybersecurity, and data governance

At the same time, it does not mean that vendors might always be detrimental for firms. In fact, they provide firms with access to AI capabilities that they might otherwise not afford. What is crucial is that firms maintain sufficient control over their data and technologies.

Finding 5: Bangladesh is moving towards AI governance, but implementation remains uncertain

Bangladesh has already moved towards developing its own AI policy framework. The Draft National AI Policy 2026-2030 addresses such areas as data sovereignty, cross-border data processing, interoperability, and vendor lock-in (Government of Bangladesh, Information and Communication Technology Division, 2024). Still, the document is at the developmental stage. Thus, an important task for further research will be to find out whether policy measures will have any impact on firms' AI-related decisions.

Finding 6: The challenges faced by Bangladesh are global

The comparison with Singapore and international experience reveals that Bangladesh is not alone in the struggle to move from AI interest to implementation. Even the well-developed Singapore was reporting that only 3.8% of companies have integrated AI into their core processes in 2026 (Ministry of Manpower, Singapore, 2026). This suggests that Bangladesh does not have to immediately implement the most advanced AI technologies. Rather, it needs to start from building the foundations first and then gradually scale its implementation.

5.3 Comparison with Previous Evidence and International Practice

The significant drawback of Bangladesh literature on the topic is the shortage of longitudinal data on how the process of AI implementation has evolved. In most cases, there is information on current perceptions and barriers, but no data on changes over several years.

This fact, by itself, opens a research gap. However, international literature is able to provide interesting comparisons. As a result of this analysis, one can see that Bangladesh suffers from many of the same problems as other countries, but its current limitations concerning infrastructure, competencies, data, and financing can amplify the importance of the barriers.

For instance, in Singapore 2026 data show that, while 28.5% of companies used AI solutions, only 3.8% integrated them in core processes (Ministry of Manpower, Singapore, 2026).

The World Bank also notes that in developing countries, the implementation of AI depends on the availability of certain conditions, such as connectivity, compute, context, and competency (World

Bank, 2025). This way, Bangladesh should aim not only at increasing the number of firms using AI solutions, but at achieving sustainable integration of the tools in order to improve supply-chain management and avoid unnecessary financial, security, or technological risks.

In spite of the fact that there are some successes in building large-scale infrastructure and developing national digital systems, including customs and port-based solutions, there is no the same evolution within individual firms.

For example, some of the most significant obstacles in 2020 included infrastructure, skills, and resistance to change. Data obtained through studies conducted in 2024 and 2025 also confirm almost the same problems, but now the cost of adoption becomes an issue as well. It means that in Bangladesh, considerable improvements were made in terms of digital infrastructure, but companies still have problems with financing, understanding and implementation of digital technologies.

The same pattern can be observed in wage digitization. In spite of the fact that this process reached the rate of 90% during the pandemic, it fell to 54% later. So, progress was not sustained.

All in all, one can observe a significant gap between developments on the national level and the current state of affairs in companies. While Bangladesh makes investments in the development of ports, customs systems, and national digital infrastructure, it does not benefit from these developments enough.

The above evidence clearly shows that Bangladesh does not face the problem of lacking information on what kind of problems exist. On the contrary, one knows that the issues include cost, skills, infrastructure, and resistance to change. In other words, one can see how successful the current initiatives are in addressing these problems and helping the right firms.

The matter is especially important in the case of small firms and suppliers. While large exporters have money, skills and management competence required to introduce innovations, small suppliers may have difficulties with following them. It leads to a growing gap between digitally capable and lagging companies.

The wage-digitization case provides another important lesson. When the company uses digital technologies because of the requirement from buyers, regulators, or any government program, it will cease to use these technologies once the requirement is canceled. It means that digital transformation has to become the part of the company's capacities and everyday operations, rather than simply being a response to outside pressure.

5.4 Implications and Proposed Framework

As it was described in the above section, there are some challenges and research gaps that should be taken into consideration in the development of a new AI-enabled SCM solution in Bangladesh. Based on them, a conceptual framework called Bangladesh AI-SCM Readiness and Governance Framework can be proposed.

It should be noted that the proposed framework cannot be regarded as a validated model since it is a conceptual framework developed based on the results of secondary research. It can be further tested empirically.

Stage 1: Assess AI Readiness

Before implementing AI in their operations, companies should assess five major aspects of AI readiness: finance, data, infrastructure, skills, and readiness of the supply-chain partner.

This stage will help the firms to understand the level of their AI readiness and whether it is worth addressing any weaknesses at the moment.

Stage 2: Start From a Pilot Project

Instead of adopting AI in all processes of supply chain management right away, firms can begin from one area such as demand forecasting, inventory management or predictive maintenance (Shahzadi et al., 2024).

After assessing the results of this pilot project, the following metrics can be analyzed:

Accuracy of forecasting; Inventory turnover; Stockout frequency; Delivery time; Operational costs; Equipment downtime; and Return on investment.

Stage 3: Develop a Governance System

From the very beginning, it is necessary to take into account the importance of data and cybersecurity, instead of trying to solve these problems after implementation of the AI system.

Firms should develop clear guidelines concerning:

Data ownership; Data allocation; Access; Cybersecurity; Monitoring of the model; Human supervision; and Audits.

It becomes especially crucial if foreign providers of cloud or AI services are considered.

Stage 4: Minimize Vendor Lock-In

Besides, firms should think about how easily it will be to change a vendor in the future.

The following actions can be made in this process:

Standardized APIs; Portable data formats; Data-ownership policies; Access to the company's data after the termination of cooperation; Alternative provider; Backup systems and exit policies (Government of Bangladesh, Information and Communication Technology Division, 2024).

Such actions are consistent with the general direction of Bangladesh's Draft AI Policy that focuses on the importance of interoperability, open standards and portability.

Stage 5: Adoption Among Other Firms

After the success of a pilot project, AI can be gradually implemented among other firms, for example, suppliers, logistics providers, warehouses and distributors (Shahzadi et al., 2024; Sharif et al., 2024).

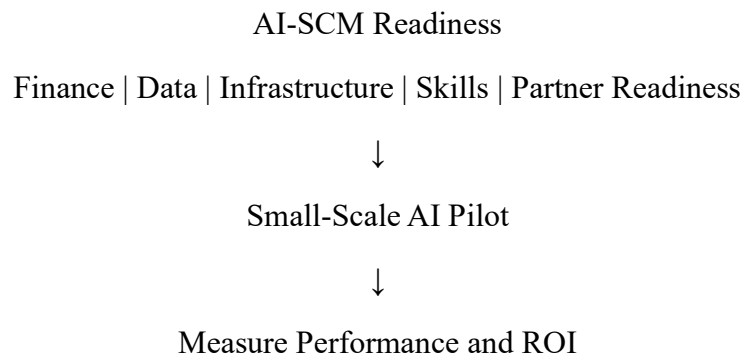
Here, the aim changes from the adoption of AI technology by the firm to collaboration with supply-chain partners.

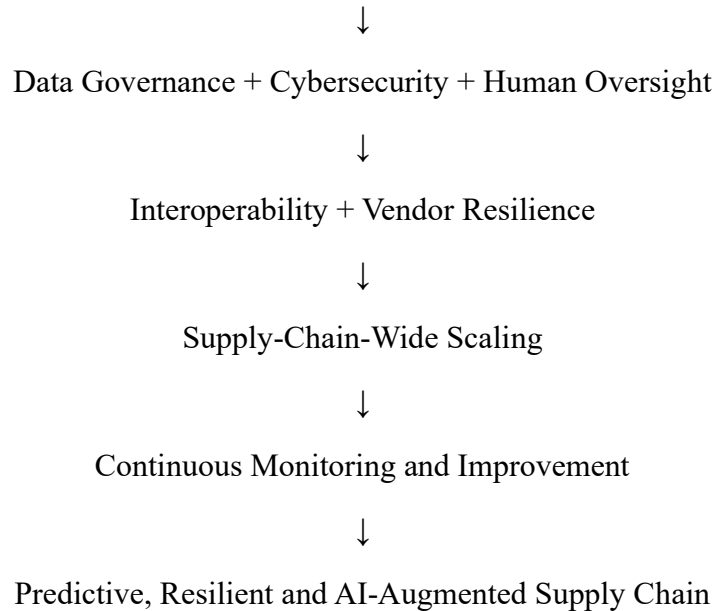
Stage 6: Continuous Monitoring of the Process

The implementation of AI technology in the supply chain management should not be treated as one-time investment.

Companies should constantly assess: Performance; Costs; Data quality; Security; Human supervision; Resilience.

Proposed Framework:





The framework addresses the main issue identified throughout this research: the challenge for Bangladesh is not simply whether AI can improve supply-chain decision-making. However, the greater problem lies in the ability to take the next step to make AI not only economically feasible but also secure and scalable for the whole supply chain. In general, it is quite possible that by improving its economic, digital, human, and governance base while implementing AI in a gradual and responsible way, AI can become a decision-making tool for the supply chain.

With regards to readiness, studies conducted in 2020 and 2024 reveal similar barriers, including cost, skills, infrastructure, and resistance to change. Such findings mean that the issues have been understood for some time already, but support has not made enough impact in terms of firm-level implementation. More efforts should be done to invest in firms, including SMEs, and not just infrastructure.

Digital payroll payment increased to 90% during the pandemic but declined to 54% after governmental support was withdrawn. It means that adoption motivated by external factors may prove unsustainable. The same concerns EU traceability and Digital Product Passport compliance. Namely, will firms keep investing in digitalization when pressure from the buyers weakens?

ICT sector in Bangladesh has developed, but only 46% of firms used computers and 50% had access to the Internet during 2019-2022. Thus, the distinction between development of the ICT industry and firm-level digital adoption should be made.

Two-Axis Digital Readiness Framework-

The digital readiness needs to be considered in two dimensions:

- ❖ Internal readiness- skills, management, finance and organizational capacity
- ❖ External readiness- digital readiness of buyers, sellers, logistics, port and customs

Thus, four types will emerge:

Quadrant A-Digitally integrated- Digitally strong both internally and externally- The companies like AR Group, Azim Group and Tusuka Tier

Quadrant B-Buyer-Carried- Digital adoption largely driven by buyer needs or regulatory requirements

Quadrant C-Capable but Isolated- Digitally capable internally, but restrained by lack of digitally capable suppliers or infrastructure

Quadrant D-Structurally excluded- Mostly SMEs and subcontractors, with little to no internal capability and digital connectivity

Digital readiness not only requires technology in place. The firm also needs to have necessary skills, finance, capacity and digitally ready partners to use the technology effectively.

The implication that follows from the TOE finding itself is that in contrast with the government incentives for digital readiness, technological readiness, compatibility with existing systems and vendor support were significant predictors of ERP adoption in the one Bangladeshi study testing TOE factors formally. In case the same applies to RMG industry as well as to omnichannel retail, the initiatives that rely on partnerships with vendors, such as BGMEA's Digital Factory Passport and its collaboration with Digital Bridge Partners, will probably prove to be more effective.

That is why we propose to adapt the TOE framework for the Bangladeshi RMG industry, as the sole Bangladesh TOE study was done in omnichannel retail industry. The adapted framework for Bangladeshi RMG industry will separate the technology factor into three elements- infrastructure reliability, ERP-legacy system compatibility and vendor support; organization factor- management commitment and digital skills of workforce; environmental factor- compliance pressure from buyers and incentives from the government for targeted industries.

6. Conclusion

It becomes clear from the above evidence that even though Bangladesh continues to progress with respect to digital infrastructure, firm level digital readiness remains insufficient. All the above-mentioned factors such as costs, skills, infrastructure and resistance remain common for the majority of the studies, indicating that the issue is not to understand the problem, but rather to deliver assistance to the firms in question.

Moreover, the research results clearly indicate the need to pay attention to the way the externally driven adoption of technology can occur. In particular, the reduction in the percentage of digital wage payments from 90% to 54% indicates that the externally induced adoption of technology tends to reduce if there is a lack of external motivation or support.

In this respect, the increasing requirements of EU traceability and Digital Product Passport for Bangladeshi exporters tend to force Bangladeshi firms to adopt new technologies.

It becomes clear that the concept of digital readiness is to be understood not in terms of whether the firm has access to technology, but rather in terms of its capacity, such as finances, skills and management and relations with buyers, sellers, logistics companies, ports and customs services.

Thus, the proposed two-axis framework reflects the specific situation of small suppliers and sub-contractors and the specific nature of their problem.

In turn, the next step that Bangladesh needs to take is to go beyond digital infrastructure development and deliver more targeted support at the firm level.

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